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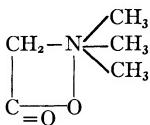
CURRENT LITERATURE

BOOK REVIEWS

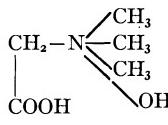
The simple plant bases

A recent book by TRIER¹ will interest students of plant physiology and plant chemistry.

The plant bases are divided into three classes: (1) the high molecular, physiologically active alkaloids peculiar to certain plants; (2) the simple alkaloids without known peculiarities and widely distributed in the plant kingdom; (3) the basic splitting products of the protoplasmic constituents, as proteins, nucleic acids, lecithins, etc. Plant alkaloids are nitrogen-containing bodies which arise in the formation or transformation of protoplasmic substances. By synthetic processes the reaction capacity of their basic H atom is locked up in such a way as to render them unavailable for resynthesis of protoplasmic substances. The primary amines are the simplest alkaloids. They are formed by the breaking up of the carboxyl group of the corresponding amino acids. The simplest case would be the removal of a molecule of CO₂. The amines of nearly all of the amino acids are known. They are seldom found in higher plants as they are at once converted into higher alkaloids either by condensation or by the simple process of methylation, which is a very general process in plants and has the effect of throwing the methylated body out of the field of chemical activity. The betains are completely methylated amines. This relates them directly to the amino acids. They are simple alkaloids and may be further defined as substances in which one assumes an intra-molecular saturation of the amino group with the acid carboxyl group. They cannot replace cholin in the lecithin molecule.



Betain (glycocollyl betain)



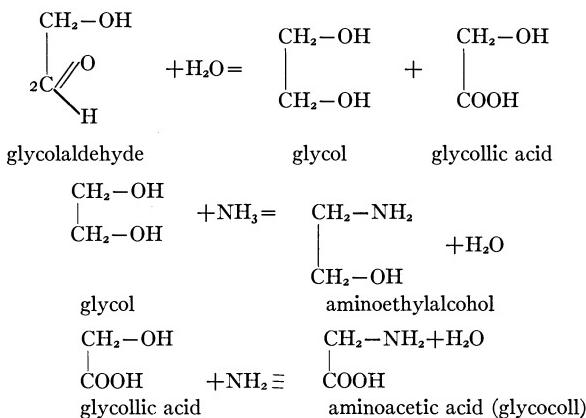
(hydrated form)

Cholin is formed by a methylation process of colamin (aminoethylalcohol), which is the primary amine of serin. This methylation occurs within the lecithin complex; therefore it is not a primary building stone of lecithin but appears only as a hydrolytic product of this substance. Xanthine bases also undergo methylation, as caffeine from xanthine.

The hypothesis formulated to explain the formation of the simplest amino

¹ TRIER, GEORG, Über einfache Pflanzenbasen und ihre Beziehungen zum Aufbau der Eiweißstoffe und Lecithine. pp. iv + 117. Berlin: Gebrüder Borntraeger. 1912.

acid includes also an explanation of the primary origin of characteristic building stones of lecithins, since the acids of the proteins and the alcohols of the lecithins arise through one and the same reaction. This would explain STOKLASA's finding that protein and lecithin-formation always run parallel. The formaldehyde, formed by the reduction of CO₂ in green plants, is condensed to glycolaldehyde. By the Cannizzaro reaction, one molecule of glycol and one molecule of glycollic acid arise from two molecules of glycolaldehyde. These products furnish aminoethylalcohol and glycocoll by aminization.



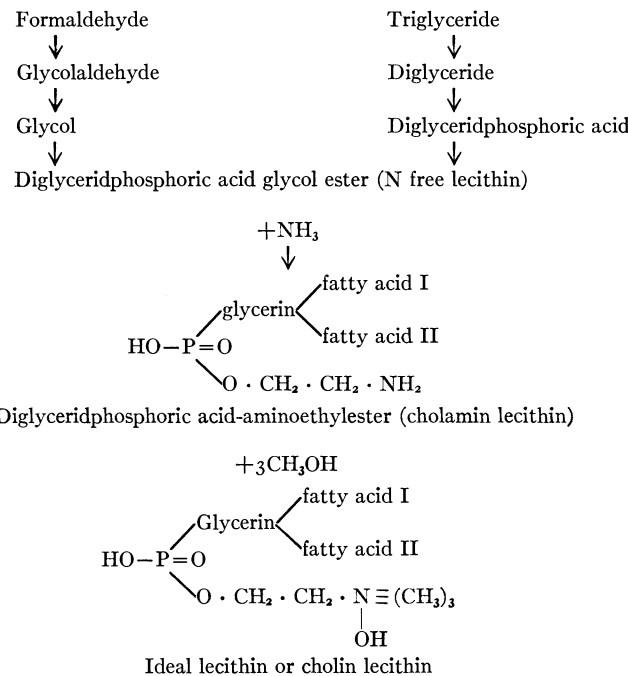
This reaction furnishes, therefore, the simplest amino acid, the mother substance of the simplest betain and aminoethylalcohol which may give rise to cholin by methylation as noted above. Analogous with the above reaction a further condensation of formaldehyde is postulated for the formation of glycerinaldehyde, and from this may arise glycerin and serin by the reaction of Cannizzaro and by aminization. We now have the glycerin for the formation of fats, lecithin, and other phosphatids. The higher amino acids may be considered derivatives of serin, and alanin a reduction product of the same. The author denies the probability of HCN being an intermediate substance in the primary formation of proteins.

The author extends his hypothesis to the mechanism of methylation. By the reaction of Cannizzaro, formaldehyde can furnish methyl alcohol and formic acid. The methyl alcohol can in turn furnish the alkyl groups for the methylation of metabolic products. Since this scheme is based upon the work of the chlorophyll apparatus, it will not explain the mechanism of the methylations, which frequently occur in animals.

The Cannizzaro reaction is accelerated by the enzyme aldehydase, which has been definitely proven in this case to be a hydrolytic enzyme. In addition to this, if oxygen is present, the alcohols formed at the same time can be oxidized. We have here a case of an enzyme accelerating both hydrolysis and oxidation.

Asparagin, the amide of aspartic acid, has usually been given an important place in studies of protein metabolism in plants. SCHULZE has shown that it must be formed at the cost of amino acids, and according to his investigations it is a secondary product of protein changes and is not a primary building stone of proteins. TRIER cites considerable evidence in support of his contention that aspartic acid, the mother substance of asparagin, is formed from glutamic acid and leucine by oxidation processes. This agrees with the fact that where there is a strong accumulation of asparagin in germination the seed proteins show a high content of glutamic acid.

The author's views regarding the part played by the carbohydrates in phosphatid preparations are of great interest, since it is impossible at the present time to fit them into any scheme of lecithin constitution, although TRIER himself has proved that phosphatids from seeds contain reducing substances in chemical combination. He also found that the fatty acids increase and the phosphorus decreases as the content of reducing substances increases. This led the author to think that the regular phosphatid of STRECKER and HOPPE-SEYLER must be accompanied in plants by a substance of the character of animal cerebrosides, that is, substances which furnish, as hydrolytic products, fatty acids and nitrogen bases but no phosphoric acid. The following scheme shows the gradual building up of lecithins according to TRIER:



Those interested in plant physiology and plant chemistry will find this little book of great value on account of the many positive facts stated and because of the critical way in which the author has attempted to organize these facts. Some of the hypotheses may be more sweeping than the facts warrant, but they should serve to stimulate work on these important but difficult problems.—
CHAS. O. APPLEMAN.

MINOR NOTICES

Michigan trees.—The first thing that recommends this little manual² to the student of trees is its convenient pocket size (5 by 7.5 inches), which makes it more readily useful in the field than more pretentious volumes. A closer examination reveals the fact that it is well illustrated by carefully made drawings of the leaves, flowers, buds, and fruit of each species. The keys seem to have been constructed with more than usual care, and are in duplicate, one based largely upon the leaves, for use during summer; and a second making use of the bud and twig characters as a basis of identification during the winter. In order that the bulletin may appeal to as large an assemblage of readers as possible, the use of technical terms has been reduced to a minimum, and those necessarily employed are fully explained in a glossary. The arrangement of drawings and descriptions of species upon pages facing one another adds to the ease with which the manual may be consulted.—GEO. D. FULLER.

NOTES FOR STUDENTS

Mutations and inheritance in Oenothera.—DAVIS³ has recently reported a continuation of his studies of *Oenothera*. In previous papers⁴ he has described the F₁ and F₂ generations of hybrids between *O. biennis* and *O. grandiflora*. The present account deals with the behavior of F₂ and F₃ generations of the same or similar hybrids. The data presented are discussed (1) from the standpoint of their bearing upon the origin and habit of mutation of *O. Lamarckiana*, and (2) with relation to their possible interpretation by Mendelian principles of inheritance. The latter, if one may judge from the methods employed in these studies, has been incidental to the former. The primary purpose of the investigations has been to determine the possibility of the synthesis through hybridization of a type similar in both taxonomic features and mutating habit

² OTIS, CHARLES H., and BURNS, G. P., Michigan trees. 12mo. pp. xxxii+246. figs. 120. Ann Arbor: Univ. Mich. Bull. N.S. 14: no. 16. 1913.

³ DAVIS, B. M., The behavior of hybrids between *Oenothera biennis* and *O. grandiflora* in the second and third generations. Amer. Nat. 47:449-476, 547-571. 1913.

⁴ ———, Notes on the behavior of certain hybrids of *Oenothera* in the first generation. Amer. Nat. 44:108-115. 1910; Some hybrids of *Oenothera biennis* and *O. grandiflora* that resemble *O. Lamarckiana*. Amer. Nat. 45:193-233. 1911; Further hybrids of *Oenothera biennis* and *O. grandiflora* that resemble *O. Lamarckiana*. Amer. Nat. 46:377-427. 1912.